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Memorandum

To: Homestead Dam Feasibility Study
Advisory Group

Date: June 4, 2004

Project No.: 51577.00

From: Peter J. Walker, CWS

Re: Progress Report

The following memorandum provides a synopsis of our team's progress on the Homestead Dam Feasibility Study. The memo outlines some of the specific tasks that the consulting team has worked on since beginning the project, and we summarize several upcoming tasks that will be completed during the summer. We also provide an explanation of the various alternatives that have been developed during the initial stage of the Feasibility Study.

Since one of the main functions of the advisory group is to facilitate information exchange and discussion, we encourage any member to contact either Stephanie Lindloff (NHDES) or Peter Walker (Consulting Team Project Manager) with questions, comments or information. Our memo references several existing studies, and we would be happy to provide copies to anyone who requests additional information. Similarly, we hope that members of the Advisory Group that have important information to contact us to provide the same.

General Summary

The fate of the Homestead Woolen Mills Dam has been under discussion for the past several years, and several previous technical documents have reported on various aspects of the issue. Over the last month we have completed our initial review of several existing studies that were provided to us by NHDES, the USFWS and the Town. These studies include an existing HEC-RAS model of the river (which provides information about flows in the river under various conditions); an engineering and geotechnical analysis of the Thompson Covered Bridge completed by a consultant to the NHDOT in 2003; the Sediment Management Plan developed by Robert Wood in 1999; technical information and plans of the dam contained in the DES Dam Bureau files; and various NH Fish and Game plans and habitat data related to the Ashuelot.

We have also been engaged in collecting new topographic survey of the dam, the Thompson Covered Bridge and the general vicinity of these structures. Our survey team has also collected topographic survey at several river "cross-sections" as far as 4 miles upstream of the dam. More detail on the survey work is provided below.

Our architectural historian and archeologists have also been engaged in research and field work to define the historical resources of the area and have been coordinating with the NH Division of Historical Resources on those studies. Again, more detail on this work is provided below.

Summary of Project Alternatives

One key element of the feasibility study is definition of a reasonable range of alternatives. Based on discussions with the resource agencies, the Advisory Group and the general public, we provide the

following as a preliminary description of the alternatives that we plan to bring forward in the Feasibility Study. As the project progresses, we will provide a more detailed description of each alternative and will provide an analysis of the impacts and benefits of each of the alternatives.

Alternative A - No Action

This alternative would be defined as “no repair or restoration work on the Homestead Dam.” We anticipate that this alternative would be deemed unfeasible due to safety and environmental issues, based on preliminary review of dam inspection reports and on a general knowledge of the ecology of the Ashuelot River. Nevertheless, its inclusion in the study is warranted to provide a baseline against which to evaluate other alternatives. We expect that the impacts analysis portion of the feasibility study would present a full assessment of the environmental and economic impacts of this alternative.

Alternative B – Repair of the Dam with Fish Passage Installation

This alternative would involve keeping the dam in place, but taking actions to stabilize the structure and add fish passage. Two potential structural fishway options are contemplated under this alternative, a traditional denil fish ladder or a bypass channel (see Alternatives B1 and B2 below). The option of adding hydroelectric generation facilities to the dam is also considered (see Alternative B3 below).

Alternative B1 - Denil Fishway on River Left

This alternative would involve design and construction of a traditional concrete denil fish ladder along the eastern side of the existing dam (*i.e.*, river left). Initial review of the dam site suggests that construction of the ladder on river left is far more feasible than on river right due to construction access and the constraint posed by the mill structures on river right.

Alternative B2 - Fish Bypass Channel

This alternative would involve a constructed fish bypass channel parallel to the river with an entrance located downstream of the dam and an exit located upstream of the dam. The former dam tailrace flows approximately 700 linear feet downstream of the dam on river left. Approximately 100 to 150 feet of this tailrace immediately downstream of the dam was filled at some point in the past. During field review of the dam site with Jim Turek (NOAA Restoration Center) on April 20, it was determined that use of the former tailrace provides the best opportunity for construction of a bypass channel. One challenge will be to examine whether the entrance to the tailrace will be suitable to attract migrating fish or whether some additional measures will be needed to ensure that fish moving upstream do not “miss” the entrance, preferring instead to continue moving up the mainstem until reaching the base of the dam.

Alternative B3 - Add Hydropower

This alternative would involve the addition of a hydroelectric facility to the existing dam as a means to fund maintenance of the dam, which has been suggested by the Town of Swanzey. The alternative would include securing the existing dam structure and adding a denil fishway or bypass channel (as described in Alternatives B1 and B2 above) to provide for fish passage. While a full evaluation of potential hydro costs, benefits, and impacts is beyond the scope of the current study, we expect that the feasibility study will contain a review of previous hydro feasibility studies and will identify any changed conditions (*e.g.*, economic or regulatory conditions) that might have a bearing on the feasibility of constructing a hydropower facility at this location. The discussion will also include a brief, general description of regulatory and environmental considerations associated with installation of hydropower facilities. We will draw on previous hydropower applications supplied to us by John Warner (USFWS) for primary information, supplemented by knowledge of current energy market and regulatory conditions.

Alternative C – Full Removal with Rock Ramp

This alternative could involve full removal of the existing timber crib dam and construction of a rock ramp in the vicinity of the existing dam which would be designed to maintain existing water surface elevations. The most logical location for such a ramp would be at the current location of the dam, extending upstream and/or downstream some distance. The construction of a rock ramp in this location should take advantage of the existing dam as a cofferdam and the recycling of boulders from the timber crib and existing submerged trap-rock cofferdam/access road.

Alternative D - Full Dam Removal

This alternative involves the physical removal of the entire existing dam structure. This alternative may also require removal of sediments and formation of a new channel behind the dam. The study will review geotechnical boring information and the projected geomorphology/ hydraulics of the restored river channel to determine whether removal of the dam will result in a channel that will fully support the fish passage goal of the project. While the full removal alternative will typically provide the most restoration benefit, it will also create the most substantial change in the river hydraulics. Thus, the study will fully assess potential environmental and social benefits and costs. The study will provide a full cost and environmental analysis of the alternative including possible effects on the Thompson Covered Bridge, effects on floodplain communities along the impoundment, potential impacts to wells along the river, *etc.*

Survey

One project task is a complete topographic survey of the vicinity of the dam and the Thompson Covered Bridge, as well as surveying additional river cross-sections both up and downstream of the dam. Over the last month we have completed river cross sections using GPS survey equipment at locations upstream of the dam. These locations were selected based on a review of the existing FEMA flood insurance study (which will form the basis for our computer model of the river) with the goal of providing additional cross sections in areas important to developing an accurate model of the river. These cross-sections are located in the following areas: 1) at a point approximately 5,000 feet upstream of the dam (between FEMA cross sections J and K); and 2) in the vicinity of the pre-historic fish weir, approximately 4,950 feet downstream of the Cresson Bridge.

Our efforts to complete additional survey in the immediate vicinity of the dam have been delayed by high river flows. Our work scope includes time to provide a highly detailed bathymetric map of the portion of the river 300 feet up and downstream of the dam. However, the high spring flows have prevented a safe completion of this work. We are working with the NH Department of Environmental Services and the NH Fish and Game Department to develop a plan to deal with this issue, since we anticipate relatively high flows until late July.

Our survey crew completed reconnaissance at the location of the Native American fish weir. We found that the weir is currently covered with sediment, which will make detailed survey difficult. We plan to visit the site with Dr. Robert Goodby to provide a survey of the visible portions of the fish weir in the next month.

We have performed reconnaissance for horizontal and vertical control for project base data, and have completed ground survey of shoreward structures and features near the dam site. A portion of this work has been compiled into a preliminary base plan which was on display at the May 27 public informational meeting.

Cultural Resources

Our team has coordinated with the NH Division of Historical Resources during two meetings on April 22 and May 7. This coordination has helped refine the scope of our investigations into historical and archeological resources in the project area and has helped outline the process needed to comply with Section 106 of the National Historic Preservation Act.

VHB has conducted historical research and fieldwork in preparation of completing the DHR Area Form. Research has been focused on documenting the historical development of the West Swanzey Village, specifically the various mill activities at the Homestead Woolen Mill site. Research has been conducted at the following repositories: the Division of Historical Resources, the Historical Society of Cheshire County, the Swanzey Historical Society, the DES Dam Safety Bureau, and the State Library. Fieldwork to date has included photographing and mapping approximately 150 properties within the West Swanzey Village area in an effort to identify potential historic district boundaries.

Victoria Bunker, Inc., (archeological consultants) have completed background documentary research and non-intrusive visual inspection for the project. Research efforts have included: review of state-wide site files maintained by the NH Division of Historical Resources; review of primary and secondary documents relative to Native American occupancy and the historical development of West Swanzey and the Ashuelot River, including local histories, anthropological research, archeological site reports, soils maps, topographic maps and historical maps; and synthesis of data to create an interpretive context for known and likely archeological resources within the project study area. Field investigations have included walkover inspection of the project segment including the Homestead Dam and Thompson Covered bridge as well as shoreline inspection of the 5-mile reach of river by boat. During these inspections, the terrain was examined for the occurrence of archeological resources or locations exhibiting archeological resource sensitivity. As a result, site remains were discovered on the west side of the river below the Thompson Covered Bridge and a scaled field sketch was prepared, the position of the Native American Swanzey Fish Dam was verified in the river channel, the setting of known sites was confirmed, and resource sensitivity assigned throughout the project area. A draft report documenting methods and findings with accompanying maps and photographs is in preparation. Other efforts associated with the project have included attendance at agency and public meetings and data exchange with VHB's Architectural Historian.

Upcoming Tasks

Some of the key upcoming tasks are outlined below:

Drawdown

We plan to discuss the potential temporary drawdown of the impoundment with the dam owner, the Town and the NHDES. This drawdown would greatly facilitate a planned inspection of the dam, the detailed bathymetric survey, and an upcoming fluvial geomorphologic characterization. Drawdown would also allow a detailed look at the location of riffle/run habitat types in the impoundment and may allow the best means to visualize likely post-removal conditions. And drawdown might strengthen our analysis of the hydrogeological conditions in the area. The existing Homestead Dam apparently has a functional low-level drain that could be opened by the dam owner.

HEC-RAS River Flow Modeling

Once our topographic survey is complete, we will begin to refine the existing HEC-RAS engineering model of the river. This model will allow our consulting team to very accurately predict how water levels and velocities would change in the river (upstream and downstream) under the various alternatives that will be analyzed in the Feasibility Study. These results will also help us understand potential effects to a number of issues of concern. For example, the model will provide input to understand several of the concerns that Swanzey citizens have expressed about the project including effects to nearby wells, on fire fighting, on upstream floodplain forests and on recreational opportunities.

Thompson Covered Bridge

Among the major issues are concerns for the preservation of the Thompson Covered Bridge, an important crossing of the Ashuelot River that is listed on the National Register of Historic Places.

The scour analysis completed in 2003 indicates that contraction scour and local scour currently occur at the pier of the covered bridge in sufficient magnitude to warrant scour countermeasures. Based on results of newly refined hydrological and hydraulic analysis, VHB will review the existing scour model developed by NHDOT's consultant. We will also perform a cost estimate for the various scour countermeasures such as reinforcing or reconstructing the pier foundation so that this can be considered during discussions of the fate of the dam.

Sediment Analysis & Geomorphology

VHB will conduct field work with our geomorphologists and with our subconsultant Dr. John Field, an expert in river morphology. Our work will include additional sediment sampling and will characterize the existing river channel according to principles of river geology. Our analytical work will also include a computer model to predict "tractive force," which relates water surface slope and depth of flow to the size of substrate material mobilized for any given flow. A tractive force analysis will allow our engineers to determine whether existing substrates are likely to be mobilized (and during which flow events) and where scour and deposition are likely to occur. The geomorphological work and the tractive force analysis will give a good indication of how sediment sorting may occur along the river, and whether the movement of existing sediment will occur at a low enough recurrence interval (say during a seasonal summer storm) to cause excessive sedimentation downstream and problems such as riffle embedment, filling of channels and wetlands, etc.

Recreational Impacts

Potential effects to recreational use of the river are a concern, especially impacts to canoeists. In order to assess recreational impacts or changes after dam removal, the consulting team will coordinate with local river users to characterize the type and frequency of recreational uses in the reach of the river above the dam. The results of the hydraulic model will allow us to identify the reemergence of channel features such as riffles and runs that may change the recreational experience from existing conditions.

Other Tasks

A few of the other tasks that are planned for the upcoming months:

- We will coordinate with the Army Corps of Engineers to collect information on the operation of flood control projects in the watershed.
- We will review existing information to determine what, if any, effect the various alternatives might have on the Carleton Bridge and the South Branch of the Ashuelot.
- We will continue our interaction with the NH Division of Historical Resources to review the information gained during our recent work. We will also contact potential "consulting parties" to provide a formal opportunity for public involvement in this consultation.
- We will contact the USGS to discuss the existing stream gauge on the dam.